alkaline carbonates in the ashes of coal is a natural consequence of the excess of sulphate of lime always present in the ashes.—— Johann Kusta describes *Anthracemartus krejcii*, a new Arachnid from the Carboniferous of Bohemia. H. B. Genitz describes Krerscheria, a pseudo-scorpion.

Permian.—An impression of a terrestrial shell (*Dendropupa walchiarum* Fischer) has been found in the Permian beds of Saone et Loire. This is the only terrestrial mollusk of Carboniferous age that has yet been found on the European continent. *Dendropupa vetusta* was described in 1853 by Dawson, from trunks of Sigillaria in Nova Scotia, and several other Devonian and Carboniferous pulmonates have since been found in America.

Tertiary.—Johann Kusta enumerates three species of Hyopotamus and two of Anthracotherium from the Hempstead beds of the Isle of Wight.——W. Davies has verified the occurrence of Hyaenarctos in the Miocene strata of Pikermi near Athens.—— W. Davies (*Geol. Mag.*, Oct., 1884) describes *Viverra hastingsiæ* and remains of two other carnivores from the Eocene fresh-water beds of Hordwell, Hampshire.——J. S. Gardiner describes (*Geol. Mag.*, Dec.) six species of Aporrhais, all belonging to an ancestral type of the recent *A. pes-pelecani*, from the Eocene of Great Britain.——R. Lydekker describes a new species of Merycopotamus (*M. nanus*), from examples in the British museum.

Quaternary.—Entire skeletons of the cave hyæna are rare, for these animals devoured the bones of their own as well as of other species. Recently M. F. Regnault, of Toulouse, has descended into a cavity twenty meters deep in the grotto of Gargas, Hautes Pyrenees, and has found entire skeletons of hyænas, bears and wolves, the position being such that the hyænas could not get at the bones to devour them. From examination of these bones, M. Alb. Gaudry believes that *H. spelæa* is but a variety of *H. crocuta.*

MINERALOGY AND PETROGRAPHY.[1]

WADSWORTH'S LITHOLOGICAL STUDIES, PART I.[2]—This handsomely printed quarto volume of over two hundred pages and many colored plates, at first glance promises, both from its title and general scope, to be a most valuable addition to the literature of petrography; nevertheless a careful study of its contents fails to discover as much that is new and useful as was at first expected. The work aims to be an exhaustive and critical revision of all the petrographical work hitherto accomplished as well as an attempt to rearrange the same in accordance with the author's

[1] Edited by Dr. GEO. H. WILLIAMS, of the Johns Hopkins University, Baltimore, Md.

[2] Lithological Studies, Part I. A description and classification of the rocks of the Cordilleras. By M. E. Wadsworth. 4to, with 8 colored plates. Memoirs of the Museum of Comp. Zoölogy at Harvard College, Vol. IX, Oct., 1884.

somewhat peculiar views. The petrographical descriptions are, however, largely taken from the work of others, while those which are original are not sufficiently detailed; the generalizations are often broader than the facts thus far accumulated would seem to warrant; and even the statement of the writer's most original ideas regarding rock nomenclature and classification is not in certain points altogether free from ambiguity.

Chapter first, containing nine sections, deals with the interior structure of the earth; the origin and alterations of rocks and of their constituent minerals; the methods of rock-classification hitherto followed and their defects, and lastly, the proposal of the author's system of classification.

Sedimentary and eruptive rocks are held never to grade into one another, as sometimes appears to be the case. Each class possesses field and microscopic characteristics sufficiently marked to make their separation possible, although by alteration they may come to much resemble each other. All eruptive rocks of the same chemical composition were alike at the time of their formation; the present differences in structure, etc., are due mainly to the alteration of the older ones. The minerals tend to constantly pass from less stable compounds to those which are more stable for the conditions now existing on the earth. The alteration therefore varies with the age, and also, under the same conditions, inversely as the amount of silica which the rocks contain. Foliation or schistose structure is no necessary proof of the sedimentary origin of a rock. Inasmuch as the alteration of a rock goes on in some cases much more rapidly than in others, lithological character can be regarded as no index of age.

The mineral constituents of an eruptive rock are divided into three classes: 1st, those present in the magma before its extrusion (foreign); 2d, those formed at the time of the consolidation of the magma (indigenous); 3d, alteration products (secondary). The first class is regarded as composed entirely of foreign inclusions, no account being taken, as it seems, of such minerals as leucite, olivine, etc., which may crystallize out of the molten magma long before it is extruded or solidifies! Hornblende appears to be regarded as always belonging to either the first or third class.

The present systems of rock-classification, based on chemical composition, structure, mineral constituents and geological age, are reviewed in turn and pronounced artificial and unsatisfactory. Section VIII contains the statement of thirteen principles which the author thinks should underlie a natural classification of rocks. It must be confessed, however, that this attempt is not altogether satisfactory. It is stated that *all* the petrological (field), lithological (microscopical) and chemical characters of a rock must be used in determining its species, but in what way is not made clear. Mineral composition is sufficient to define varieties but not species. All rocks which may be followed from one form to

another, whatever be the changes of chemical or mineral composition or of structure, *within certain limits*, form a species; but what these limits are is not stated. A diorite derived by paramorphosis from a gabbro must be called a gabbro. Even quartz which might have replaced a basalt would have to be called basalt, strange as this would seem, unless these "certain limits" be defined. Wadsworth's classification seems to be, after all, mainly a chemical one in which the rocks of approximately the same composition, but differing in their constituents, structure or degree of alteration are arranged under the principal species as varieties.

Chapter second commences the systematic treatment of rock classes, starting with the most basic. The suggestion of Reyer, to consider the meteorites as eruptive rocks more basic than any normally found near the earth's surface, is wisely followed. Species I, Siderolite, is made to include all masses of iron, either native or in its secondary state as magnetite, hematite, etc., which are not of chemical or secondary origin. This species is of course principally represented by meteoric iron. Species II, Pallasite, includes such original, eruptive, celestial or terrestrial rocks as contain a large amount of native or oxidized iron inclosing other minerals. Twenty-two meteoric pallasites are mentioned. As a terrestrial variety of pallasite is described the so-called "cumberlandite" from Rhode Island, an apparently eruptive mass of magnetite full of crystals of olivine, feldspar, etc. Analogous to this is Sjören's "magnetite-olivinite" from Taberg, in Sweden.

Chapter third deals with Species III, Peridotite. This name was given by Rosenbusch to massive rocks composed essentially of olivine together with various pyroxenic minerals. The author classifies these as follows:

Variety 1. *Dunite* = olivine + picotite.
" 2. *Saxonite* = olivine + enstatite.
" 3. *Lherzolite* = olivine + enstatite + diallage.
" 4. *Buchnerite* = olivine + enstatite + augite.
" 5. *Eulysite* = olivine + diallage (= "Wehrlite").
" 6. *Picrite* = olivine + augite.

Serpentine is derived by alteration from all of these.

Eulysite is a name that was originally applied to a rock very rich in garnet, and it is difficult to see why it is preferred to the German term wehrlite, used for olivine-diallage rocks. Forty meteoric peridotites are enumerated, following which is a section devoted to the origin and character of meteorites in general. The "chondri" are regarded as spherules due to crystallization, and the meteorites themselves as having probably been thrown off by the sun. Then succeeds the description of many terrestrial peridotites and serpentines, with general remarks on their character and origin. Considerable space is devoted to the relations be-

tween picotite and chromite. Both are translucent with a brown color when sufficiently thin, but the latter only with considerable difficulty. The suggestion is made that the chromite may be an alteration-product of picotite.

Chapter fourth deals with the fourth rock-species, Basalt, of which, however, only such as are of meteoric origin are treated in the present portion of the work. Pages I–XXXIII at the close of the book contain valuable tables of all the chemical analyses hitherto made of the rocks described. Eight plates with forty-eight colored figures represent the microscopic structure of these same rocks in an admirable manner.

MINERALOGICAL NOTES.—*Quartz.* Professor G. vom Rath,[1] of the University of Bonn, has recently made a valuable contribution to the literature of American mineralogy by his studies of the quartz crystals from Alexander county, N. C., material for which was loaned him by Mr. C. Bement, of Philadelphia, and Mr. G. F. Kunz, of Hoboken. The crystallography of these quartzes is very varied and complicated, and the writer does not hesitate to pronounce this American locality the most interesting one thus far known in the world. The tetartohedral character of this mineral is frequently shown by the large development of the trigonal trapezohedron $-\frac{\frac{3}{2}P\frac{3}{2}}{4}$. Complicated twins and many acute rhombohedrons, especially 3R, are also common.——The same paper contains the description of tridymite from Krakatoa, in which the opinion is expressed that, as Merian has already suggested (vid. NATURALIST, March, 1885, p. 300), the form of this mineral is hexagonal, its optical anomalies being due to molecular disturbance produced by a change of the conditions under which the crystals were formed.——Much new material has been received regarding the mineral colemanite, mentioned in the March NATURALIST, which occurs in the southern part of Death valley, Inyo county, California. An exhaustive monograph on its crystallography, by Professor A. Wendell Jackson,[2] enumerates thirty-eight forms (of which $\frac{68}{11}P\bar{\infty}$, given in the *Am. Jour. Sci.* for Dec. is not one). Of these fourteen were independently observed by vom Rath,[3] and twenty by both Hjortdahl,[4] of Christiania and Arzruni[5] of Breslau. Vom Rath and Bodewig give the plane of the optical axes as perpendicular to $\infty P\grave{\infty}$, making an angle with $\grave{c}$ in the obtuse angle β of 82° 42′, for so-

[1] Mineralogische Notizen. Verhandlungen des Natur. Vereins d. preuss. Rheinland und Westph., 1884. Bonn, 1885.

[2] Bulletin of the California Academy of Sciences, No. 2, Jan., 1885.

[3] Verhandlungen d. Natur. Vereins d. preuss. Rheinland and Westph., p. 333, 1884.

[4] Zeitschrift für Krystallographie, Vol. x, 1885, p. 25.

[5] Verhandlungen d. Natur. Verein d. preuss. Rheinland and Westph., p. 342, 1884.

dium light. The real optical angle, $2V_a$, is 55° 20′. These results agree very closely with those obtained by Hjortdahl.——Hans Thürach[1] has contributed an interesting paper on the wide distribution of zircon and certain titanium minerals as microscopic rock-constituents. Decomposed rocks were especially investigated, from which these minerals were the more easily separated. Rutile, anatase, brookite and pseudo-brookite were all identified. Tourmaline, staurolite, garnet and some other minerals are also spoken of in the same connection, and a long list of localities given where all these substances were observed.——Kalkowsky[2] finds that in certain rocks, especially nepheline-basalts from Randen in the Hegau, Baden, and from Tharand in Saxony, twins of olivine are quite common. The twinning plane is a brachydome whose angle over OP is nearly 60°, as was observed by vom Rath in free crystals of monticellite from Mte. Somma.——Knop[3] has made a thorough chemical study of the augite occurring in the various rocks of the Kaiserstuhl in Baden. One group is interesting on account of their containing TiO_2, the amount sometimes exceeding four per cent. This would naturally be supposed to isomorphously replace SiO_2, but on account of the violet color of the augite in which titanium is most abundant, it is suggested that this element may also be present as Ti_2O_3, replacing ferric iron.——Schuster[4] adds over 200 pages to his former paper on the crystallography and structure of danburite, making his numerous and careful measurements the basis of general conclusions regarding the nature of forms possessing very large indices, to which Websky has applied the name "*vicinal-planes.*" For the many important results obtained, reference must be made to the original article. Vicinal-planes are found (p. 490) to possess a definite relation to some principal plane having simple indices, with which they are associated. This relation is a genetic one. Vicinal-planes are regarded, so to speak, as "induced" by the joint action of two forces, one exercised by the new molecules in their effort to form a really new plane and the other exerted by the old plane to retain its exact position.——The crystalline form of the element thorium has been for the first time determined by Brögger.[5] Although apparently rhombohedral, the minute crystals (only 0.15^{mm} wide and 0.015^{mm} thick) are really regular, being a combination of a cube and octahedron.——Schaeffer[6] describes a new American locality for tantalite, the Etta tin mine in Dakota. Its composition is $TaO_2 = 79.01$; $SnO_2 =$

[1] Ueber das Vorkommen mikroskopischer Zirkone und Titan-mineralien. Würzburg, 1884.

[2] Zeitschrift für Krystallographie, Vol. x, p. 17, 1885.

[3] Zeitschrift für Krystallographie, Vol. x, p. 58, 1885.

[4] Tschermak's Min. und Petr. Mittheilungen VI, pp. 301–515, 1885.

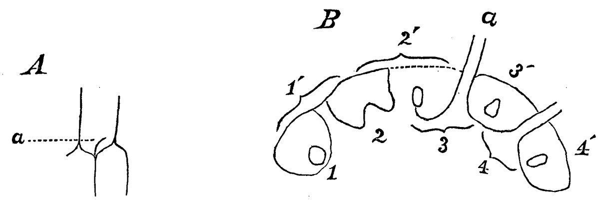
[5] Meddelanden från Stockholms högskola, No. 1, 1883.

[6] American Journal of Science, Dec., 1884, p. 430.

0.39; FeO = 8.33; MnO = 12.13; total 99.86. Sp. gr. = 7.72. ——Hidden[1] mentions a new locality in Colorado for phenacite, xenotime and fayalite, also another for rutile, emerald and hiddenite (spodumene). A crystal of zircon from Burgess, Canada, gave the same author a new plane ⅓P not hitherto observed in this mineral.

BOTANY.[2]

THE NODE OF EQUISETUM.—If a section is made lengthwise through a node of a fertile stem of *Equisetum arvense*, each vascular bundle is seen to divide into two parts, each part uniting with a corresponding part of an adjacent bundle to form one of the bundles of the next internode (Fig. *A*.). If the section be



A. Showing the branching of the bundles at the node, seen longitudinally. *B*, a horizontal section of a portion of the bundle ring in a node.

made radially through one of the teeth of the sheath or rudimentary leaves, a bundle is seen to pass down and unite in the node with one of the bundles of the stem. Fig. *B*, a horizontal section in the node of a portion of the bundle ring, shows how this leaf bundle originates. It is seen that the bundle of the leaf is derived, not by a simple separation of a portion of the outer phlœm, part of the bundle in the stem, but that it originates where that bundle begins to divide, and in such a manner that its vessels are continuous with the xylem of the divided bundle.

Each bundle of the stem therefore divides at the node in three parts—two lateral portions, each with xylem and phlœm, which by rearrangement continue the bundles of the stem, and a central part which bends outward into the leaf.

In Fig. *B*. bundle 3 has divided, and given origin to the leaf bundle *a*, and two lateral portions, one of which has united with half of the divided bundle 4 to form the perfect bundle 3′, the other half being ready to unite with half of the dividing bundle 2 to form a bundle at 2′. A section a very little farther up would show bundle 2′ completed and bundle 2 in the condition that 3 now is. As the leaves do not arise quite on the same horizontal plane successive sections show the process repeated both to the

[1] American Journal of Science, March, 1885, p. 249.

[2] Edited by Professor CHARLES E. BESSEY, Lincoln, Nebraska.